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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/536,570

03/30/2006

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GEML 4420-3

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12/17/2007

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EXAMINER

PETKOVSEK, DANIEL

ART UNIT

PAPER NUMBER

2874

MAIL DATE

DELIVERY MODE

12/17/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/536,570

Applicant(s)

BULTHUIS ET AL.

Examiner

Daniel J. Petkovsek

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on pre-amendment filed May 26, 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 May 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 3/30/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

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DETAILED ACTION

This office action is in response to the pre-amendment filed May 26, 2005. In accordance with the pre-amendment, claims 3, 4, 7, and 10-21 have been amended.

Claims 1-24 are pending.

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The prior art documents submitted by Applicant in the Information Disclosure Statements filed on March 30, 2006, have been considered and made of record (note attached copy of forms PTO-1449).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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4. Claims 1, 2, 4, 5, 11, 14, 16, and 18-22 are rejected under 35 U.S.C. 102(a/b) as being anticipated by Hashizume et al. NPL (cited in IDS filed March 30, 2006).

Hashizume et al. NPL teaches (Figure 1, Design, Experimental Result) an optical branching component comprising: two optical waveguides 1, 2 coupled between two optical couplers, wherein there is an effective optical path length difference between the two waveguides, and wherein each optical coupler comprises a multi-mode interference waveguide *configured to* support at least two guided modes, and the coupling strength of at least one said optical coupler monotonically decreases with increased wavelength in the operational wavelength region of the component (see design and results), which clearly, fully meets Applicant's claimed limitations of independent claim 1.

Regarding claim 2, the strength of each optical coupler monotonically decreases with increasing wavelength (see design and results).

Regarding claims 4 and 5, the optical couplers each comprise an MMI coupler, each of which has the same coupling strength.

Regarding claim 11, the geometry is inherently "optimized" in order to provide the best performance and minimum integrated RBE.

Regarding claim 14, the component *is capable of* tapping an optical signal with a ratio of no greater than 4%.

Regarding claim 16, the two optical waveguides 1, 2 bend away from each other at least along a portion of their lengths, while being coupled together by respective MMI waveguides in proximity to each other, in which the waveguides are substantially straight in the region.

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Regarding claims 18, thermo-optic switching is disclosed by Hashizume et al. NPL.

Regarding independent claim 19, the optical system is configured so that each optical coupler is optimized to achieve a minimum polarization dependency of the optical coupler. Regarding claim 20, the geometry is inherently "optimized" in order to provide the best performance and minimum PDL.

Regarding claim 21, silica on silica technology is disclosed.

Regarding independent claim 22, the optical system is configured so that the two optical waveguides 1, 2 bend away from one another along at least a portion of their lengths, being in proximity with one another in at least one region adjacent the MMI waveguide in which the region the waveguides are substantially straight.

5. Claims 1, 2, 4, 5, 11, 16, 19, 20, and are rejected under 35 U.S.C. 102(b/e) as being anticipated by Arai et al. US 2001/0051018 A1.

Arai et al. US 2001/0051018 A1 (currently U.S.P. No. 6,631,223 B2) teaches (ABS, Figs. 1A, 9, 10, 11A, [0041]-[0043]) an optical branching component comprising: two optical waveguides 10, 11 coupled between two optical couplers 6, 7, wherein there is an effective optical path length difference between the two waveguides, and wherein each optical coupler comprises a multi-mode interference (MMI) waveguide *configured* to support at least two guided modes, and the coupling strength of at least one said

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optical coupler monotonically decreases with increased wavelength in the operational wavelength region of the component, which clearly, fully meets Applicant's claimed limitations of independent claim 1.

Regarding claim 2, the coupling strength of each of the MMI couplers monotonically decreases with increasing wavelength.

Regarding claim 4, each coupler is MMI (see Fig. 1A).

Regarding claim 5, the MMI couplers have the same coupling strength.

Regarding claim 11, the geometry is inherently "optimized" in order to provide the best performance and minimum integrated RBE.

Regarding claim 16, the two optical waveguides 1, 2 bend away from each other at least along a portion of their lengths, while being coupled together by respective MMI waveguides in proximity to each other, in which the waveguides are substantially straight in the region.

Regarding independent claim 19, the optical system *is configured* so that each optical coupler is optimized to achieve a minimum polarization dependency of the optical coupler. Regarding claim 20, the geometry is inherently "optimized" in order to provide the best performance and minimum PDL.

Regarding independent claim 22, the optical system is configured so that the two optical waveguides 10, 11 bend away from one another along at least a portion of their

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lengths, being in proximity with one another in at least one region adjacent the MMI waveguide 6, 7 in which the region the waveguides are substantially straight.

6. Claims 1, 16-19, and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Hatanaka U.S.P. No. 6,922,510 B2.

Hatanaka U.S.P. No. 6,922,510 B2 teaches (Fig. 6 and 8) an optical branching component comprising: two optical waveguides coupled between two optical couplers, wherein there is an effective optical path length difference between the two waveguides, and wherein each optical coupler comprises a multi-mode interference waveguide *configured to* support at least two guided modes, and the coupling strength of at least one said optical coupler monotonically decreases with increased wavelength in the operational wavelength region of the component, which clearly, fully meets Applicant's claimed limitations of independent claim 1.

Regarding claim 16, the two optical waveguides bend away from each other at least along a portion of their lengths, while being coupled together by respective MMI waveguides in proximity to each other, in which the waveguides are substantially straight in the region.

Regarding claims 17 and 18, the electrode heaters (41, 42, 43) are disposed on at least one waveguide.

Regarding independent claim 19, the optical system *is configured* so that each optical coupler is optimized to achieve a minimum polarization dependency of the optical coupler.

Regarding independent claim 22, the optical system is configured so that the two optical waveguides bend away from one another along at least a portion of their lengths, being in proximity with one another in at least one region adjacent the MMI waveguide in which the region the waveguides are substantially straight.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 3, 6-10, 12, 13, 15, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hashizume et al. NPL (cited in Applicant provided IDS).

Hashizume et al. NPL teaches (Figure 1, Design, Experimental Result) an optical branching component comprising: two optical waveguides 1, 2 coupled between two optical couplers, wherein there is an effective optical path length difference between the two waveguides, and wherein each optical coupler comprises a multi-mode interference waveguide *configured to* support at least two guided modes, and the coupling strength

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of at least one said optical coupler monotonically decreases with increased wavelength in the operational wavelength region of the component (see design and results).

Regarding independent claim 19, the optical system is configured so that each optical coupler is optimized to achieve a minimum polarization dependency of the optical coupler.

Regarding independent claim 22, the optical system is configured so that the two optical waveguides 1, 2 bend away from one another along at least a portion of their lengths, being in proximity with one another in at least one region adjacent the MMI waveguide in which the region the waveguides are substantially straight.

Hashizume et al. NPL does not *explicitly* teach the dependent claim limitations of claims 3, 6-13, 15, 17, 23, and 24.

Regarding claim 3, 23, and 24, Hashizume et al. NPL does not explicitly teach that the MMI waveguides are configured to support *only* two guided modes. However, a person having ordinary skill in the art at the time the invention was made would have recognized that using optical waveguides that support only two modes would have been an obvious modification (if not actually inherent in Hashizume et al. NPL). Guiding only two modes would eliminate the chances for substantial errors to be passed in case of a malfunction in the coupling system.

Regarding claim 7-9, 12, 13, and 15, Hashizume et al. NPL does not explicitly teach the desired ranges and results for phase thickness, phase delay, integrated RBE, or tap ratios. A person having ordinary skill in the art at the time the invention was

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made would have recognized that it is well known to use a number desired or predetermined ranges and results, including particular phase thickness, phase delay, integrated RBE, or tap ratios. At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to have desired phase thickness, phase delay, integrated RBE, or tap ratios because Applicant has not disclosed that the desired ranges of phase thickness, phase delay, integrated RBE, or tap ratios provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected the Hashizume et al. NPL optical component(s) to perform equally well with particular phase thickness, phase delay, integrated RBE, or tap ratios because the optical coupling of signals would be efficient and have lower optical loss and the coupling device would be accorded the ability to modify specific phase ranges. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Therefore, it would have been an obvious matter of design choice to modify Hashizume et al. NPL to obtain the invention as specified in claims 7-9, 12, 13, and 15.

Regarding claims 6 and 10, one of ordinary skill in the art at the time the invention was made would have recognized that it is an obvious modification in the art to use MMI couplers with different coupling strengths, or to have optical path length differences less than the shortest operating wavelength. Although the reference to Hashizume et al. NPL is silent to these limitations, using MMI couplers with different strengths, or having optical path length differences less than the shortest operating

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wavelength could reasonably occur in this optical system, since optical components are not always made to the exact same specifications, and even minute differences in coupling strength can occur between MMI couplers; further the path difference could be made very small in certain configurations by one of ordinary skill, in view of Figure 1, even though the waveguides have different properties.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: PTO-892 form references A-F.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J. Petkovsek whose telephone number is (571) 272-4174. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Daniel Petkovsek
December 13, 2007

/Tina Wong/
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AU 2874